HARRY DCR 7700/1
PRELIMINARY
USER GUIDE

QUANTEL

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1 INTRODUCTION

This is a Preliminary User Guide for operators of Harry. Unless otherwise noted it refers to Software Version V1-04. It will eventually be superceded by a full manual when available. This guide is intended to give a brief description of Harry and the control system, a description of the menus and menu boxes, and to give the normal settings of all the hardware switches in Harry. It is NOT a tutorial on driving Harry, a hardware reference manual or a trouble-shooting manual.

This Guide describes all the facilities available on Harry. Some of the features are optional or do not need to be fitted for the baseline Harry to operate. These features are marked (+).

2 THE CONTROL SYSTEM.

2.1 The Pen And Tablet

Harry is controlled from a touch tablet which will be familiar to users of the Quantel Paintbox, since it is an identical unit. It consist of a large flat tablet, a pressure sensative pen, a conventional typewriter-style keyboard and a small joystick box, all wired to a small electronics box. These, in conjunction with a single video output which must be easily visible to the a user seated at the touch tablet, are all the controls normally necessary to drive Harry.

When the pen is held close to the tablet (within about half an inch) a cursor in the form of a cross (usually yellow) appears on the screen. This cursor moves about the screen as the pen moves around the tablet, allowing the user to indicate points on the screen by moving the cursor to the specified position and gently pushing the pen (which is pressure sensative) onto the tablet. There are no further operational controls necessary in normal use of Harry.

2.2 Menus

This simplicity of the controls is made possible by a powerful menu system, which will again be familiar to users of the Paintbox. Most of the time Harry is being used there will be displayed on the screen a dark area with superimposed upon it light boxes containing words describing various options: this is the menu, and it normally occupies the bottom quarter of the screen. The rest of the screen is occupied by one or more pictures.

The functions of the various boxes are described in detail later in this manual. When a box is referenced, the text in it is printed underlined to distinguish it from descriptive text.

A menu option is selected by positioning the cursor over the box describing it and pressing the pen down. As selections are made on the menu, further boxes may appear representing options which are available for facilities selected. In some cases the whole menu will change when a new operational mode is selected.

2.3 Box Colours

The boxes may be of various colours. Grey boxes are turned off; if a box is grey it means that the option it represents is available but has not been selected. Pink boxes are turned on; if a box is pink it means that the corresponding option is selected. Blue boxes are of two types, alternate selections and numeric boxes. If a box is always blue (and is thus blue when first visible) it represents one of a number of alternatives, one of which is always required. When such a box is pressed, its contents will change to the next option; this operation should be repeated until the desired option is shown. If a box is grey but goes blue when selected, it is a numeric option and the number in the box can be altered by means described below. Green boxes normally represent the exit from the current menu. When pressed they return the display to the menu from which the current menu was entered.

There are three ways of altering the contents of a numeric box. When a numeric box is turned on (blue), three extra boxes will appear in the right hand side of the menu. Two of these boxes are labeled Inc and Dec. When one of these is pressed the current contents of the numeric box will be incremented or decremented as appropriate. If the pen is held down the contents will soon begin to count up or down. Alternatively, pushing the joystick up and down will have the same effect as these two boxes. The third box is normally blank. However, if a number is typed on the keyboard it will be entered into this box, which acts as a "holding register". When the Return key is pressed, any number in this holding register will be transferred to the current numeric box.

2.4 Clips

Harry can store several thousand frames of digitised video. In order to make sense of them these are organised into clips. A clip consists of a sequence of frames which are normally played in order; it is easiest to think of it as the same as a length of 35 millimeter film. Like such a film clip, Harrys clips can be played backwards or forwards, and also cut and joined. Unlike a film clip, copies can be made instantly and the frames will never degrade with "handling". When a clip is "copied", no actual copying is required because Harry can reuse the frames already in storage. Harry automatically tracks how often each frame in store is used, and will not allow it to be overwritten until all clips that use it have been deleted.

2.5 Errors

If an error occurs, either because of operator error or machine malfunction, a coloured error bar will appear above the menu with an error message. This error bar will disappear as soon as another menu box is pushed.

There are four colours of error bars. Grey bars are for information only. They are displayed when Harry has started a job which may take some time, to report progress. Blue bars are user errors, when the user has requested an impossible function (such as to play a non-existant clip). Green errors are for when Harry has been unable to carry out a reasonable request for some external reason (for example, not enough free space in storage). Pink errors are for when Harry makes a mistake.

3 THE MENUS

3.1 Self Test

When switched on Harry displays a dark screen with a single pink bar across containing the words "Self Test". This display is held for about 40 seconds while the machine is setup and is then replaced by the main operational display, known as the Workbench and described below. No user operations are possible while this display is visible.

3.2 The Workbench Menu

Once the initial Self Test phase is completed Harry enters the main operational level, called the Workbench. In this mode there is a conventional menu at the bottom to the screen. The area above the menu is divided into three vertical strips known (for reasons which should become obvious) as the reels.

3.2.1 The Reels - When Harry is switched on the reels are empty. This is represented by a green box in the centre of the reel containing the word Empty. However in normal use clips of video will be put onto the reel. Each reel can contain any number of clips, each of any number of frames. When a reel has one or more clips on it, the empty box is replaced by a display of the clips. The clip is displayed in a manner very similar to a traditional film clip: as a number of small frames organised one above the other. Only about four frames are visible on the screen at any time, but by jogging and shuttling through the clip (explained below) any section of a clip can moved to the visible area.

Normally each small frame is separated from the next one by a small grey gap of only a few lines. However each reel can contain a number of clips. Where one reel ends and another starts the gap is larger - about half the height of a frame. Also the reels "wrap around": if the clips on a reel are moved far enough in one direction, the first clip will come round again. If there is only one clip on a reel, the top and bottom of the clip can both appear on the screen at the same time. When this occurs, the gap between them is made so large that they can only just get on the screen at the same time. To summarise: small gap = the same clip; medium gap = different clips; large gap = opposite ends of the same clip.

3.2.2 The Ident Box - In the bottom right hand corner of each frame on the reels is a grey box with a number in it. This box is known as the Ident Box. The number in the box is either the frame number from the start of the clip (starting from one), or the seconds:frames of the timecode allocated to that frame. The Ident box is the action box for the frame; when it is necessary to point out a frame (see, for example, the Cut or Insert boxes, below), this box should be pushed.

In the descriptions of the Workbench menus below, whenever instructions are to point to a frame, it is the ident box of that frame which must be pointed to. Similarly, when the instructions are to point to a clip, it is the Ident box of any frame of the clip which must be pointed to. If an empty reel needs to be pointed out, the Empty box area which appears instead of frames functions as an Ident Box.

3.2.3 Jogging The Reels - Clips on the reel may easily be moved up and down on the reel, in a manner similar to jogging a VTR. Simply press the pen down on any part of the picture (but NOT the Ident box) and slide the pen up or down as desired. The reel will follow the pen, allowing simple adjustments to be easily made to the position of the clips.

3.2.4 Shuttling The Reels - In order to move the reels faster or further than they can conveniently by jogged, the reels can be set running past the visible window in a manner analogous to the shuttle function of a VTR. This is done using the tall barred rectangles to the left of each strip. This is a move up/down control. If the pen is pushed near the top of the strip the clips will move smoothly upwards; similarly pushing near the bottom will move them smoothly down. The speed can be varied smoothly from fast (at the end of the box, where the bars are close together) to stopped (at the centre, where the box is blank) to fast in then opposite direction (at the other end of the bar) by sliding the pen up and down the box while keeping it pressed.

3.2.5 Permanent Boxes - There are two columns of boxes which are always visible on the Workbench menu. On the left, the four boxes In/Out, Edit, Process and Misc are used to select one of four different submenus. On the right, the three boxes Get Left, Get Centre, Get Right are used to fetch clips from the library to the workbench. In the same column, the View box is used to view a clip at full size.

The Get Left, Get Centre, and Get Right three boxes are used to get clips from the library onto the working area. When one of them is pressed, the display immediately changes to the Library Fetch Menu (described below). If a clip is selected while in this mode, the display will return automatically to the Workbench mode with the selected clip on the specified reel.

The View box allows a clip to be examined at full size. To view a frame or a clip at full size, turn on this box and point to the frame to be viewed. The View Menu (described below) will be entered to view the selected clip. On entry to the View Menu the clip being viewed will be positioned at the frame which was pointed to. The facilities of the View menu can then be used to play or step through the clip backwards or forwards. When the View menu is exited, the last frame viewed will be positioned at the center of its reel. This allows the user to position accurately within a clip by examining it frame by frame at full size.

3.2.6 The In/Out Submenu - Turning on the In/Out box, on the left hand side of the screen, makes available a number of boxes associated with moving clips around in Harry. They are Record, Play, Save, and Library.

The Record box calls up the Record Menu (see below). This is used to get pictures into Harry from external sources such as cameras, VTRs and other TV devices (but not Paintbox - there is a more efficient way of handling painted input: see below). The display switches to the Record Menu as soon as this box is pressed.

The Play box calls up the Play Menu, which is used to play out the clips stored in Harry when the operations to be performed have been completed. To play a clip, turn on this box and point to the clip to be played.

The Save box is used to save a clip on the reels. To save a clip, turn on this box and point to the clip to be saved: the display will switch to the save menu (see below). Saving a clip does not remove it from the desk; the original version is still there and must be deleted to get rid of it.

The Library box calls up the Library menu, which is used to manage the library, providing functions to delete clips or transfer them from the library to the desk etc. The Library menu appears as soon as this box is pressed.

3.2.7 The Edit Submenu - This menu provides a set of facilites similar to, but in some ways more powerful than, an Editor. Boxes on this menu allow clips to be cut, spliced, copied, erased etc.

The Cut box cuts a clip on the Workbench into two pieces (a similar operation to cutting a film strip with scissors). To cut a clip in two, turn on this box and then point to the frame after which the cut is to be made. The clip will be split in two, with a gap appearing at the point designated.

The Insert box is used to join clips together, reversing the effect of a cut. To insert one clip into another, turn on this box, point to the clip to be inserted, then point to the frame after which the cut is to be made. The inserted clip will be removed from whatever reel it is on and spliced into the other clip. Note that a simple butt-splice is effected by "inserting" the second clip after the last frame of the first clip.

The Replace box is used to "overwrite" part of a clip with another clip - similar in effect to a VTR Insert Edit. To carry out this operation, turn on this box, point to the clip which will be used to overwrite the other, then point to the first frame to be replaced. The replacement clip will be removed from the reel it is on and overlay the clip onto which it is placed.

The Copy box is used to make a copy of a clip. To copy a clip, turn this box on and point to the clip to be copied, then to any clip on the reel onto which the copy is to be placed (or the Empty box to put the copy onto an empty reel). A copy will instantly be placed on the designated reel. Note: copying a clip in this manner does not actually use more of Harrys storage. Since the frames of the original and copy clips are identical, Harry just notes that the frame is used twice and used the same data to display it. The space will not be freed until both copies are deleted. However, all this is handled automatically and the user can behave as if the two copies were different, except that the amount of free space does not fall.

The Delete box has two functions: to delete a clip from a reel, and to delete a single frame from a clip. Which of these two functions is performed is controlled by a box which appears to right of the Delete box when it is turned on. If this box is set to Clip then a whole clip will be deleted. If it is set to Frame then a single frame will be deleted. To do a deletion, turn on this box and ensure that the appropriate mode is selected, then point to the frame to be deleted (frame mode) or the clip to be deleted (clip mode). The clip will disappear from the reel. Note: only the designated frame or clip pointed will disappear. Other clips which use the same frames (on the Workbench, in the Library etc.) will be unaffected.

The Repeat box also has two functions: to repeat every frame in a clip, and to repeat a single frame within a clip. Which of these two functions is performed is controlled by a box which appears to right of the Repeat box when it is turned on. If this box is set to Clip then every frame in the clip will be repeated. If it is set to Frame then a single frame will be repeated. The number of repetitions is set by a second box which appears with the mode box and contains a "*" (times) character, and the current number of repeats selected. To repeat a frame or clip, turn on this box and ensure that the appropriate mode is selected and the repeat count is set to the desired value, then point to the frame to be repeated (frame mode) or the clip to be repeated (clip mode). The displayed clip will be modified accordingly. Note: repeats do not take up any extra space in the system.

The Move box moves a clip from one reel to another. To move a clip, turn this box on, point to the clip to be moved, then to any clip on the reel onto which the copy is to be placed (or the Empty box to put the copy onto an empty reel). The box will be moved at once to the new reel.

The Dissolve box(+) joins two clips together with a dissolve. To do this, turn on the box, point to the clip before the dissolve (the clip to dissolve out) then point to the frame in the other clip (the clip to dissolve in) AT THE POINT THE DISSOLVE IS TO END. Thus to do a ten frame dissolve, push frame 10 of the second clip.

After the two clips for the dissolve have been selected, the system must take some time to calculate all the intermediate frames of the dissolve. While it does so a message box will appear above the menu saying how may frames have been processed. If a mistake has been made, the dissolve process can be aborted by tapping down with the pen before it finishes. If the process is not aborted, when the last frame has been processed, the reels will be updated to remove the second clip from its original position and to show the new composite clip. Unlike most other features on the Edit submenu, a dissolve decreases the amount of free space by the number of dissolved frames.

3.2.8 The Process Submenu - This submenu contains a number of facilities which involve processing clips: that is to say, taking one or more clips, taking some action to modify them, then replacing them on the workbench. For example, the Paint box can be used to touch up a clip, the Key(+) box to key one clip over another, the Stretch box to change the length of clip and so on.

Tha Paint box enters the Paint menu in order to use the Quantel Paintbox in conjunction with Harry. To do this, turn on this box and then point to the clip to be touched up in the Paintbox. To return to using the Paintbox after previously having used it without setting up a new clip, press the Same Clip box instead of an ident box. This also allows painting when no touch-up clip is wanted. The display will switch to the Paint Menu (see below).

The Interlace and Deinterlace boxes serve complementary functions of separating and joining up the fields of a clip. The most obvous time this is needed is when wanting to touch up in the Paintbox a clip of fast-moving action. If this were touched up in the conventional manner on the Paintbox, the touched up areas would not have any field flicker, making the touching up obvious. Deinterlace converts each field of a clip into a frame by duplicating it into the other field of the frame (line doubling). The two fields can then be modified separately in Paintbox and then reinterlaced using Interlace. To Interlace or Deinterlace a clip, turn on the appropriate box and point to the clip to be processed. Harry will then generate the interlaced/deinterlaced clip. While this is going on a progress message will be displayed, and the process can be aborted by tapping down the pen.

The Key(+)to calls up the Key menu, which is explained in detail below. For keying, three clips are needed: the front, the back and the key. To enter the key menu, turn on this box and then point to the three clips to be used (in order) as front, back and key. It is quite reasonable for the key to be the same clip as one of the others (particularly the front, for self-keying). As the third clip is pressed, the display will switch to the Key Menu.

The Inv Dom'ce (Invert Dominance) box inverts the field dominance of a clip. It can sometimes happen (e.g. due to the incorrect setting of a Telecine machine) that the fields composing a frame are incorrectly paired, giving a juddery effect when played. This box corrects this effect by re-pairing the fields the other way round. For a further discussion of Field dominance, see the Enginering Setup menu below. To do this, turn on this box and point to the clip to be processed.

The Reverse box reverses a clip. It operates in two modes, field mode and frame mode, controlled by a box which appears to the right of it when turned on. In frame mode the frames are reversed but the order of fields within the frame is unchanged: this is for frame-oriented original material (Paintbox frames, film). In field mode the frames are reversed and the order of fields within the frame is also reversed. This gives correct reversal for video originated, interlaced, material. In field mode the clip produced is one frame shorter than the original, because the first and last fields of the clip have to be deleted. If necessary this can easily be compensated by repeating the first and last frames.

To reverse a clip, turn this box on, select the required mode, and point to the clip to be reversed. Harry will then generate the reversed clip. As the new clip is generated, progress reports are given about the number of frames done. The process can be aborted by tapping the pen down.

The Feedback box calls up the Feedback menu, which allows a clip to be output by Harry, processed by another video processing machine (e.g. a Digital Effects generator such as Encore or Mirage) and fed back into Harry to create a new, processed, clip. To process a clip in this manner, turn on this box and point to the clip to be processed. The display will switch to the Feedback menu (see below).

The Stretch(+) box stretches a clip i.e. changes the number of frames within it, thus speeding it up or slowing it down. The number of frames to which to stretch the clip is specified by the To box which appears to the right of the Stretch box when turned on. The length to which the clip is stretched may be either longer than the original (expansion) or shorter (compression). The algorithm used for stretching the clip in Software Version V1-04 will work well with frame material (Paintbox animation or film) but may generate undesireable artifacts on some clips containing fast moving field movement - future software releases will improve this. To stretch a clip, turn on this box, ensure that the new length in the To box is set to the desired value, and point to clip to be stretched. Harry will then generate the stretched clip. As the new clip is generated, progress reports are given about the number of frames done. The process can be aborted by tapping the pen down.

The Cine cmpress box is used to correct the unpleasant effects when 24 frame per second film material has been transferred to 30 frame per second NTSC video (it is not normally useful in Pal machines). When film is transferred to NTSC video, the extra frames required are inserted by the telecine machine holding evey second film frame for three fields instesd of two, thus generating a frame containing one field from one frame of the film and one from the next, which will give severe field flicker. If a clip of such video is inspected (e.g. using View) it will be seen that it has runs of three non-flickering frames followed by two flickering frames. The function of this box is to recover the original 24 film frames, so that subsequent processing by Harry will not be disturbed by the unpleasant flicker. To do this it is necessary to identify the three good/two bad sequence. When this has been done, turn on this box and point to the first of a block of three good frames anywhere in the clip. The clip will be compressed down to the original film frames. The process can be aborted by tapping the pen down.

3.2.9 The Misc Submenu - The Misc Submenu contains a number of miscellaneous facilities which are not expected to be frequently used.

The Eng Setup box calls up the Engineering Setup menu (see below), which is used to set up the input and output video parameters. When it is pushed, the display shifts immediately to this menu.

The Diagnostic calls up the Diagnostic menu, which provides a suite of aids for an engineer attempting to correct hardware faults in the machine. When it is pushed, the display shifts immediately to this menu. Since the functions of the boxes within this menu cannot be understood without a far deeper understanding of Harrys hardware than this manual can give, this menu is not documented any further here. It should only be used by an experienced engineer, though no serious harm can be done by misuse of the facilities provided.

The Chng Number alters the format of the numbers displayed in the Ident Box of a clip. Each clip may display either timecode or frame number; this box switches the display mode for a clip from one mode to the other. To do this, turn on this box then point to the clip: the display will change at once.

The Chng Tcode alters the timecode of a clip. When it is pressed four boxes appear to the right of it, representing the hours, minutes, seconds and frames of the timecode. When a frame is pointed out, this timecode is allocated to the frame indicated and the display of that frame shifts to timecode mode.

3.3 The Record Menu

The Record menu is used to enter source material into Harry, from such sources as VTRs and cameras. Video from external sources is recorded by Harry, and made into a clip which can then be put onto the workbench or into the library for manipulation. There are three groups of controls: input selection (on the left of the menu), which control which of the various video sources is to be controlled; start/stop controls (in the centre of the menu) which control when recording occurs, and management controls (at the bottom of the menu) for saving the recorded result.

3.3.1 Source Selection - Recording can be made from one of four sources: the Coded input (NTSC or Pal composite video), the RGB input(+), the Component input(+) (Y, R-Y, B-Y) or the Digital input from another Quantel Digital device such as Mirage or Encore. Note that the RGB and Component inputs are in fact the same connections, the interpretation of the signal varying. These are selected using the four boxes Coded, RGB, Component and Digital. To select an input, turn on the appropriate box: the input picture will appear on the area above the menu.

3.3.2 Start And Stop Selection - Recording can be started in three ways: manually, on a press of the pen; when a particular timecode is received; and when a particular input cue is received (see below for descriptions of timecode and cue inputs). Selection is performed by the box at the top of the central column of the menu. This can be toggled between Start On Pen, Start On Cue, and Start On Timecode. When Start On Timecode is selected, a set of four boxes appear to the right of the time code at which recording is to start (hours, minutes, seconds and frames). When Start On Cue is selected, one box appears to the right with the cue number of the cue which is to start recording (there are four input cues).

Recording can be stopped on the same ways as it is started (start and stop do not need to be done in the same way). There is a fourth option for stopping recording: Stop After, with an associated box giving the number of frames to be recorded. When this option is selected, recording stops automatically after the specified number of frames have been recorded. For example, setting Start on Cue and Stop after 1 would allow a single frame to be recorded each time the external cue (connected, perhaps, to a foot pedal) was triggered.

When using timecode start and stop it is worth noting that the start timecode is the code of the first frame to be recorded, and the stop timecode is the timecode of the first frame NOT to be recorded. Harry starts and stops when the timecode input is equal to the specified value; if the timecode does not appear (perhaps because it is a dropped frame) Harry will not react even if the input timecode goes on to a later time.

Harry reads both Longditudinal Time Code (LTC) and Vertical Interval Time Code (VITC). If LTC is connected and valid, it will be used. Otherwise Harry will switch automatically to using VITC.

The input cues are relay closures (see below). If Start On Cue is selected, Harry assumes that it is in the "don't start" state when Go is pressed, and starts when it changes state. Similarly for the stop cue, Harry assumes it is in the "don't go" state when the recording actually starts and stops when it changes state. Thus specifying start and stop on the same cue causes recording to start when this cue changes state and continue until it changes back to the original state. Cues are sampled during field blanking (approximately). If pulsed cues are being used, for safety the pulse length should be between one and two fields.

3.3.3 Other Recording Options - The Skip box allows a "stop frame" type of recording. If turned on it causes Harry to delay the number of frames specified in the box beside it after recording each frame from the input. Thus setting a skip of 2 would cause a three times speeded up recording.

The Normal/Inv Domin./Cine cmprss box allows Harrys treatment of fields to be altered. As a rule, this box should be left in the Normal state unless special processing is required. Harry stores frames of video, each of which consists of two fields. One field is defined as dominant (See the Engineering Setup menu a full discussion of field dominance). In Normal mode, Harry makes up a frame by recording the dominant field and the following (non-dominant) field. If Inv domin. is selected a frame consists of the non-dominant field followed by the succeeding dominant field.

The Cine Cmpress setting is available only in NTSC. This is for material originated in film (24 frames per sec) but converted to 30 frames per sec video by playing one frame for 2 fields then the next frame for 3 fields. The Cine Cmpress option allows this to be converted back to the original 24 frames per sec in order to allow it to be manipulated in the original version. It is necessary to trigger the recording at a precise point (usually from timecode) and set the Phase box which appears to say which phase of the 5-field sequence the recording starts at. (This is usually done by trial and error). Provided storage space is available, there is an easier way of doing this by the desk menu.

The Eng Setup box calls up the Engineering Setup menu (see below) to adjust the Input and output Engineering parameters.

3.3.4 Recording - When the correct start, stop and other options have been set up, recording proper is initiated by pressing the Go box. The menu disappears and is replaced by a very small menu with two boxes: Finished on the left, and a a statement of what it is waiting for on the right. Recording will then start when the appropriate event occurs: a pen press for manual start, the appropriate timecode for timecode start or the cue changing for cue start. When it does so the word Recording appears at the bottom of the screen.

Once started, recording will stop when the appropriate event occurs, but can always be aborted with a pen press. When recording has stopped, it can be restarted by a recurrence of the cue (this is useful when recording a frame at a time using Stop After). To leave the recording mode, press the Finished box. This will return the display to the full Record Menu.

To assist interfacing to other machines, Output Cue 9 is set (relay closed) when Harry is ready to record (i.e. as soon as Go is pressed) and Output Cue 10 is set when Harry is actually recording.

3.3.5 The Recorded Clip - When the display returns to the Record menu (after pressing Finish), some frames will have been recorded. The number of recorded frames and the number of free frames is displayed in the long box at the bottom of the screen. This clip can be checked by use of the View box to examine the recorded clip.

If the recording contains the desired frames, it is necessary to transfer it to the Workbench where it can be worked on or to the Library for storage. This is done by means of the Save box. When this box is pressed, the display switches to the Save Menu (see below) to save it. If the recording was started on timecode, the saved clip will be use timecode display on the Workbench, otherwise it will use frame numbers.

Saving a clip does not erase it (Harry tries never to lose information unless explicitly instructed). Once a clip has been saved, or if the clip recorded was not as desired, the Wipe box will clear the recorder down for future use.

Finally, the End Record box leaves the Record menu and returns to the Workbench. Note that leaving the record menu does NOT delete any recorded clip: when the record menu is re-entered the recorded frames will still be there, and any further recording will be appended to them.

3.4 The Play Menu

The Play menu is used to play clips held by Harry out to other machines (usually VTRs). It provides facilities to synchronise play with other machines. Most of the facilities are exactly the same as those in the Record Menu, so they are not discussed in detail here.

3.4.1 Start Selection - The same start options are provided for Play as for starting Record. They function in an identical manner and so will not be discussed further here.

3.4.2 Other Play Options - The Normal/Inv Domin./Cine Expnd offer facilities complementary to those of the Record Menu. The only difference is that instead of compressing 3/2 video down to conventional frames, Cine Expnd expands conventional frames in the same manner as a telecine machine, duplicating every fourth field to give a 3/2 expansion.

The Continuous box, when turned on, causes the system to loop continuously while playing, until stopped with a pen push, instead of stopping at the end of the clip.

The Eng Setup box calls up the Engineering Setup menu (see below) to adjust the Input and output Engineering parameters.

3.4.3 Playing - Once the start mode is setup, Play is initiated by the Go box. When this box is pressed, the menu and cursor will disappear completely and the first frame of the clip to be played will appear on the output. When this frame is ready, Harry will wait until the start event (pen press, timecode or cue) occurs. When it does, the clip will play through at normal speed until the end, where the last frame will be frozen (unless the Continuous box is turned on, in which case it will restart at once). Tapping the pen down will then return to the Play menu.

Play can be aborted once running, or when waiting for timecode or cue, by tapping down the pen. This returns instantly to normal mode.

To assist interfacing to other machines, Output Cue 11 is set (relay closed) when Harry is ready to play (i.e. as soon as the first frame is ready, frozen, on the output) and Output Cue 12 is set when Harry is actually playing (i.e. after the start cue or timecode is received).

3.5 The Painting Menu

This menu is called up to use the Quantel DPB7000 Paintbox to which Harry may be connected. It is called up from the Workbench menu, when a clip to be touched up may be designated. When this menu is displayed, the upper half of the menu shows the current "canvas" of the Paintbox.

Access to the paintbox is controlled by the Paintbox menu box. When this box is turned on, Harry instantly hands control over to the Paintbox. The display switches over to the normal Paintbox display and the workstation functions exactly as for a normal Paintbox.

When a Paintbox is used in conjunction with Harry, several extra boxes appear in the Paintboxes Animation menu. These are discussed in detail below. However, one important one is th Back to H box. When this box is pressed, control returns immediately to Harry and Harrys Painting Menu reappears at the bottom of the screen. After returning to Harry, it is quite reasonable to switch back to the paintbox again, in which case the paintbox will be completely unchanged. This is frequently done in animation to view a clip being compiled, before adding more frames to it.

The successive frames passed from the Paintbox to Harry (see discussion of Paintbox extensions for how this is done) are accumulated by Harry into a single clip, the length of which is displayed in the long box at the bottom of the screen. This clip can be examined by using the View, box which switches to the View Menu. It can also be saved in the library or transferred to the Workbench for editing by pressing the Save box, which switches the display to the Save Menu. As always, saving a clip does not erase the original which can still be added to. Erasing the clip is done by the Wipe box, which clears all the frames painted so far.

The Paintbox menu is left by pressing End Paint, which returns the display to the Workbench menu.

3.6 The Keyer Menu

The function of the keyer is to combine two clips in a controlled way to produce a composite clip in which selected area of one clip (the Front or foreground) clip have been laid on top of the other (Back or background) clip. In order to do this a third clip (the Key clip) is provided from which Harry can derive a pattern (the key) which specifies where the foreground is to be inserted. The key clip must be related to the Front clip (and will often be the same clip), but need have no relationship to the Back.

Harry has two separate keyers, a Luminance keyer which uses the brightness of the key frame to generate a key signal, and a Chrominance keyer which uses the colour of the key frame to generate the key. Either of the keyers may be used, or they may both be used together. If they are used together, the two keys are combined so that only areas of the selected colour and the selected brightness will be keyed. They are controlled by the Luminance and Chrominace boxes, the matching keyers operating when the boxes are turned on.

The keyer may be used either to Key Out or to Key In selected colours. Key Out mode is the mode normally associated with chroma-keying: any area in the key frame which Harry recognises as being of the key colour is taken out of the Front frame, allowing the Back frame to show through. This can be used to remove areas of (e.g.) blue from the front, revealing the background. In Key In mode, only in areas where the key frame is the correct colour is the foreground inserted. This might be used to insert a coloured caption over a background.

Unlike some keying systems, Harrys has a Linear (as opposed to Switching) keyer). This means that at the edges of key areas the key signal, instead of cutting of sharply at some critical value, tapers off evenly as the colour of the key frame changes away from the key colour. This means that, when correctly set up, there need be no "jaggies" round the edge of the keyed area.

3.6.1 The Keyer Display - When in the keyer menu, there are five possible pictures which can be displayed above the menu: the front, the back, the key, the key signal generated inside Harry and the final result. These are selected by the Show Front, Show Back, Show Key in, Show Key, and Show result boxes respectively. In normal use the usual display is the Result, but when setting up the keyer the others can be useful.

3.6.2 Setting Up The Keyer. - There are two ways of setting up the keying levels, selected by the Levels Auto and Levels Manual boxes. In Auto Mode, the colours and brightnesses for the keyer are selected simply by pointing to the relevant areas on the screen. In Manual mode, a table of numbers is filled in to set up the keyer. It is expected that normally users will use only the Auto mode, since the Manual mode is rather cumbersome and difficult to adjust. It is provided so that users can record the keyer settings for re-use at a later date.

3.6.3 Auto Setup Of The Keyer - In auto mode, there are two phases to setting up the keyers. The first is to tell the keyer the main colour being keyed. For example, if a traditional chroma key is being used, it is necessary to tell the machine whether green or blue is being used as a background colour. The second phase is to fine tune the range of keyed colours and the key softness to achieve the desired result.

Setting the main colour is done using the Set Key Col box. Turn on this box then point to an area of the key which is strongly coloured with the key colour (it may be necessary to display the key input while this is being done). This should result in the large, even areas of the key being keyed in or out: if it does not, move the pen gently around within the key area while holding it pressed until Harry has correctly set up the "rough" key. It is important not to key too much at this stage, since any area keyed cannot be unkeyed (if too much is keyed, turn the Set Key Col box off then on and start again). Note: when the key colour is set, the keyer is set to minimum softness (see below).

Once the main key colour has been set up, the keyed area can be adjusted to widen the range of keyed colours. This is done using the Key More and Key Less boxes. When Key More is turned on, pointing to a colour on the screen will adjust the key so that that colour is in the keyed area (whether this adds or removes the point from the result depends upon the state of the Key Out/Key In box). When Key Less is turned on, the keyer will be adjusted so colours being pointed to will be removed from the keyed area.

Key More and Key Less can be used alternately to adjust the keyer to achieve the result desired. When pointing to colours, if the pen is held pressed then Harry will continuously read colours pointed to by the pen and update the display accordingly. However, the update rate is fairly slow (a few times a second), so that is is better to move the pen slowly than to scribble.

When the key is nearly right, the key softness can be adjusted by using the Softer and Harder boxes. These are press-and-hold boxes - holding the Softer Box will cause the key to become steadily softer and softer, and similarly for the Harder box.

3.6.4 Manual Setup Of The Keyer - In order to understand how to use the manual setup of the keyer it is necessary to understand how the keyers work. Harry stores digitised video using the SMPTE/EBU digital sampling standard, which stores the picture as a luminance signal (called Y) and two colour difference signals: Blue-Y (called U) and Red-Y (called V), each of which is digitised as a number in the range 0 to 255 (in fact the whole range is not used, but that does not affect this discussion). To key, Harry defines for each of the Y, U and V component signals a range of values which will produce a maximum key. Either side of this there is a soft band in which the key generated gets progressively softer. Thus if the range is from 40 to 57, with a softness of 5, then points whose value is less than 35 or more than 62 will be totally unkeyed, points from 40 to 57 will be totally keyed, and points in between will be partially keyed, giving a transparent effect. This is done for the Y signal (if the Luminance keyer is selected) and for both U and V signals (if the chrominance keyer is selected). The keys are then combined together such that a point must be keyed on all three keys to be keyed on the final output.

The three boxes Y levels, U levels, and V levels select the three different component signals, the values of the top of the keyed range, the bottom of the keyed range and the softness being displayed in the boxes High, Low and Soft respectively, where they can be altered by the user.

Both methods of setting the key levels can be used alternately: altering the manual levels alters the automatic settings and vice versa. Thus if Auto setting gets the level right but it needs softening, it is easy to switch to Manual and alter the softness.

3.6.5 Desaturate - A common problem when chroma keying is that a coloured halo is left around the edges of a keyed object because of effects such as backlighting of the keyed object. The desaturate facility (controlled by the Desaturate box) is used to improve this. When turned on it selectively removes the colour from areas of the picture which are "contaminated" with the colour being use by the Chrominace keyer (it is only available when the Chrominace keyer is being used).

3.6.6 Other Boxes - In either setup mode, but particularly in Auto mode, it may be necessary to see and point to the area of picture under the menu at the bottom of the screen. The Menu Top box allows this: when turned on the menu shifts from the bottom of the screen to the top, uncovering the bottom of the picture.

3.6.7 Making The Keyed Clip -

Once the key levels have been set up, the final stage is to make the keyed clip. This can be done frame by frame using the Next Frame box. Every time this box is pressed, the current keyed frame will be saved to the result clip and the keyer will step onto the next frame, stepping all three of the input clips together. The levels can then be readjusted if desired on the new frame. Alternatively, if the key levels are approximately correct, the pressing the Go box will cause the keyer to run continuously, keying each frame in turn. It will stop when the pen is tapped down or when it reaches the end of any of the clips. At the end of a clip it will reposition back to the start of the clip, so that the display when it stops will show the first frame again.

When a clip has been produced, it can be inspected using the View Result box, which switches to the View Menu to inspect the clip produced. The Save and Wipe boxes can be used to save and erase the clip produced in the same way as those on the Record Menu.

3.7 The Feedback Menu

The Feedback system is used when a clip held in Harry is to be processed by another piece of video processing equipment, for example a digital effects processor such as Encore or Mirage. The way it works is that Harry holds a frozen frame of video on the output. The external machine is expected to process that frame and return it to Harrys input, where it can be recorded. When Harry has recorded the processed frame, the next frame is fetched for processing, and a signal out from Harry can be used to tell the external machine to step on to its next stage (if that is meaningful). Thus a whole clip can be automatically fed through the external machine and a new, processed, clip created in Harry.

When an effect machine such as Encore, whose state (the position to which it has moved the picture) changes from field to field, is used with Harry in this mode, it must step through its effect stage by stage, holding each position while the next frame from Harry is processed. Enable and cue this facility, Harry sets Cue 10 when entering Fesedback mode, then pulses Cue 11 eachtime it records a frame. This pulse can be used to tell the effects machine to step on to its next frame.

The feedback mode can be used in either field or frame mode, selected by the Input Field and Input Frame flags. In Frame mode Harry will record both fields at the same time while issueing a single pulse on Cue 11 for each frame in the original clip. In field mode, Harry will record the two fields separately, issueing a pulse for each, before stepping onto the next frame. The dominant field is recorded first (see Engineering Setup menu for description of Field Dominance).

There are three ways of using the feedback system: Delay, Cue and Syncro modes, selected by the After, Cue and Synchro boxes respectively. In Delay mode, Harry will place a new frame on the output, delay a set number of fields (set up in the Fields box) before recording the processed video. In Cue mode, Harry outputs a frame then waits for an input cue from the external device before recording the processed frame.

Synchro mode is used when the external device is one, such as Encore, which has both a Video delay (delay between a frame being placed on its input and the processed version of the same frame appearing on the output) and a Control delay (delay between the "new data" cue output on Harry and the external machine stepping on to a new configuration). Such a machine can always be used in Delay mode, but Synchro mode attempts to speed up processing by overlapping the Control delay with the time spent by Harry re-recording the processed data and readying the next frame.

Three numbers are required to define the behaviour in Synchro mode, held in the Pre roll, Cue After and Delta boxes. The After time defines the number of fields between Harry presenting a frame on the output and the first (or only) cue being issued to step on to the next frame. The Delta number defines the number of frames after the first cue that the second cue will be output and is used only in Field mode. The Pre Roll number defines the number of fields delay after the first cue at which Harry records the input field or frame.

To assist in setting up this menu for use with Encore, the Set Encore box forces the Syncro mode data boxes to the correct value for use with Encore.

The Coded, RGB, Component and Digital boxes selects to which of the four possible inputs the processed video is being fed back. No Output selector is necessary since all the outputs operate together.

The Go box initiates the actual Feedback process: when this is pressed the menu disappears and the feedback process is intitated. Obviously, before this buox is pressed the External machine must have been set in the appropriate state for the feedback process. The process will stop automatically when the end of the clip is reached, or can be stopped manually by pressing the pen.

The Save, Wipe and View boxes serve the same functions as in many other menues (see, for example, the Record menu) and are therefore not explained in detail here.

3.8 The Library Menu

The Library is a filing system in which any number of clips can be stored. When the Library Menu is selected, the screen above the menu is a window in which twelve stored clips are displayed. There are two display modes selected by the two boxes Titles and Browse. In title mode the clip title, length and start timecode of the clip are displayed in twelve long boxes in the centre of the screen. In Browse mode a single frame from each clip is displayed, the frames being arranged in three rows of four pictures. The top left is the same clip as the first title, the one to its right is the second title and so on.

When the library contains more than 12 clips a box saying Down appears on the menu. If this is pressed, the display window is moved down to the next 12 clips. When this happens a box saying Up appears, allowing the user to step back up the library. The Up and Down boxes will appear whenever they can be used (i.e. there are more clips to move Up/Down towards).

The Top box returns to the top of the library wherever the current position may be. This is usefull to "compress" the display when several clips have been deleted.

The menu contains a set of action boxes: Delete, View, Rename, To L Reel, To C Reel, and To R Reel. These boxes are used in conjunction with the title boxes or the browse frames.

To delete clips, turn on the Delete box and point to the title or browsed frame of one or more clips to be deleted. As the boxes are touched, they will disappear to indicate that they have been flagged for deletion. However, as a safety precaution they are not deleted at once: as the title or browse is blanked out, another box saying Confirm appears on the menu: deletion occurs when this box is pressed. To cancel a deletion, turn off the Delete box without pressing Confirm.

To view a clip, turn on the View box and point to the title or browse frame of the clip to be viewed. The display switches to the View Menu.

To rename a clip, turn on the Rename box and point to the clip to be renamed. The menu will change to the "keyboard" display, as used on the Library Save menu (see below). The title can then be retyped or edited. Pressing End will return to the library menu, when the clip will have been retitled.

The To L Reel, To C Reel, and To R Reel boxes put clips onto the specified reel of the workbench. Turn on the required box and point to the clip to be put on the workbench. The cursor will briefly flash red to indicate that the job is being done.

3.8.1 Clearing The Directory - On the Library Menu is one very dangerous box: Wipe Dir. This box, like the Delete box, has a Confirm box with it. When a wipe is confirmed ALL CLIPS IN THE SYSTEM ARE ERASED, including clips on the Workbench and elsewhere, and the system auto-restarts itself. When restarted, the library contains one clip which contains all the available space in the system. Normally this clip will be deleted before operations start. However in case of some disaster such as wiping the directory accidentally, this clip can be edited to salvage data on the disks. DO NOT USE THIS BOX UNLESS YOU ARE CERTAIN YOU KNOW WHAT YOU ARE DOING.

3.9 The Library Fetch Menu

This menu is similar to the Library Menu. It is called up to fetch a clip from the Library. The Browse, Titles, Down and Up boxes function as for the library menu. To select a clip, point to its title or browsed frame: the display will then automatically return to the previous menu. To return without selecting a clip, press the End Fetch box.

3.10 The Save Menu

This menu is called up to save a clip from one menu (such as the keyer or recorder). The clip may be saved either on the Workbench or in the Library, selected by the four boxes on the left of the screen: In Library, On Desk L, On Desk C, and On Desk R. To save a clip, select the appropriate destination, set up the title as explained below if saving in the library, and press End. The clip is saved and the display returns to the previous menu.

Clips in the library have a title up to forty characters long. When save in the library is called up, a scratch line appears on the screen with a "keyboard" area - this will be familiar to users of the Paintbox. The title can be typed by pressing the keyboard boxes on the screen. However, when the keyboard is displayed the typewriter keyboard attached to the touch tablet can also be used. The boxes Upper, Lower and Other switch the screen simulated keyboard between upper case, lower case, and numeric/punctuation displays (they do not affect the keyboard, which has a normal Shift key). The Rubout box and the left arrow on the keyboard delete the last character. The Clear box and the Delete key on the keyboard clear the display. When End or the keyboard "return" character is pressed, the clip will be put into the library with the designated title.

3.11 The View Menu

This menu is called up from many places to examine a clip at full size. It is a very small menu (only one box high) in order to obscure as little as possible of the picture. In order to fit as many boxes as possible into this menu, the contents of most of them have been abbreviated to symbols.

The single arrow boxes, <- and ->, allow a clip to be stepped through frame by frame, respectively backwards or forwards, to find a particular frame. The double arrow boxes, <-<- and ->->, boxes allow the clip to be played respectively backwards or forwards at normal speed. Playing stops when the pen is pressed or automatically at the end or start of the clip. However, if re-started at the end of the clip it automatically goes back to the beginning. The arrow and bar boxes, [<- and ->], jump instantly to the start and end respectively of the clip being viewed. The rightmost box on the menu shows the frame number or timecode of the frame currently being viewed.

The View Menu is left by pushing the End View box. If an output clip (e.g. from the recorder) is being viewed, viewing has no effect on the clip. However if any other clip is being viewed (e.g. a clip on the Workbench), then when the Move box is turned on when leaving the view menu, on return to the previous menu the clip is moved t so that the "current frame" is the last frame viewed. In the case of the Workbench, this leaves the last frame viewed on its reel at the centre of the screen window. If the Move box is turned off then the position is not changed.

3.12 The Engineering Setup Menu

This menu contains the controls over the input and output video sources. All the adjustments which on earlier machines were made by knobs on the front panel or inside the machine are numerically controlled in Harry from this menu. Additionally, Harry can store eight different sets of these values in an internal non-volatile memory, to allow instant reconfiguration for different studio setups.

In this menu the area above the display may be set to display any of the possible input sources to Harry. These are selected by the boxes on the left of the screen: Coded, RGB, Component, and Digital. As each box is turned on, the controls appropriate to it appear on the screen. Additonally, the controls on the output are always displayed. The controls available are listed below. Each control is a single numeric box which can be set by typing numbers on the keyboard or adjusted using the joysticks or the Inc/Dec boxes (see above).

3.12.1 Pemanently Visible Controls - These contrcls, which are present whatever the video source, are Op H phase, Op S Phase, and Ip H Phase.

3.12.2 Coded Controls - These controls affect the codec (NTSC or Pal) input. They are Gain, Black Level and Hue (or Burst Phase in Pal).

3.12.3 RGB Controls - The controls, which affect all three inputs, are Gain and Black Level.

3.12.4 Component Controls - These controls, which affect the Component (Y, R-Y, B-Y) input, are Luma Gain (or Y gain), Chroma Gain and Black Level.

As well as displaying the inputs, the display can be frozen using the Freeze box. When frozen, internally generated split colour bars can be displayed by pressing the Colour Bars box. These bars should be used to set up the output correctly before setting up any of the inputs in order to ensure that there are not cancelling errors on input and output. The menu can be moved to the top of the display (to reveal the bottom) by turning on the Menu Top box.

3.12.5 Field Dominance - Harry stores frames of video, each of which consists of two fields, numbered 1 and 2. Normal video transmision consists of an infinite sequence of alternating fields ..21212121̄2.. . When these are paired into frames, they may be divided after either of the fields, yielding either the sequence ./12/12/12/.. or ../21/21/21/.. . The former is referred to as Field 1 Dominance, and the latter as Field 2 Dominance (regarding the first field of the frame as dominant). Normally it does not matter which is chosen as long as it is consistant since the sequence recorded will be reproduced exactly at the output. If however there is a cut in the source material is is important that the cut occur between frames and not in the middle, which would produce a frame with fields from totally different sources. Conventions for the position of cuts are not uniform, so Harry can be configured for either dominance system. However, by default Harry will come up in the commonest operational mode for the standard in which it is configured, which is F1 Dominant for Pal and F2 Dominant for NTSC.

The F1 Dominant and F2 Dominant boxes are used to select the current machine dominance. WARNING: since the order of fields in frames already stored is fixed, if the field dominance is changed, all clips aready in the store will now have incorrect dominance. This can be corrected by the used of the Inv. Dom'ce facility on the desk, at the cost of shortening the clip by one frame, or by playing it out with inverted dominance in the Play menu.

Note for the technically inclined: By international standards, Field 1 is defined as the field which starts with a field group in which the start of the first broad pulse is at the begining of a line (in Field 2 this pulse starts in the middle of the line). Thus the commonest convention for both Pal and NTSC is that cuts occur between the half-lines, though the numbers allocated to the fields containing these lines vary between video standards.

3.12.6 Saving And Restoring Setups - As described above, Harry can have eight different setups saved. These are selected by the Setup numeric box. Pressing Save Setup copies the current setup into the specified save file, overwriting what was there before. Pressing Get Setup copies a saved setup to the current setup, changing all the boxes.

3.13 The Diagnostic Menu

The function of the Diagnostic Menu is to assist a Service Engineer in fault finding within Harry by selectively exercising separate sections of the machine in a way which is not possible in the normal menus. It cannot be explained except in term of a full breakdown of how Harry works. Such a lengthy description is beyond the scope of this manual and the Diagnostic Menu is not explained any further here.

4 ADDITIONS TO PAINTBOX MENUS

When Harry is connected to a Paintbox, several additional boxes appear on the Paintbox. These are on the Animation menu, where they are controlled by a new box saying Harry. The new boxes are: Buy, Sell, Next and Back To H.

The Buy box "buys" a frame of video from Harry. When the Paintbox is selected by Harry, a clip to be touched up normally specified. Each time the Paintbox "buys" a frame, the next frame of this clip is transferred from Harry to the Paintbox. The Sell box "sells" a frame back to Harry: Harry accumulates these frames into a clip, which can be then be further edited within Harry. The Next box is the same as Sell immediately followed by Buy.

The Back to H box returns control to Harry, and the display switches to Harrys Painting Menu

5 CONFIGURATION

This section lists the necessary configuration for switches etc. tc be set on Harry for normal operation.

5.1 CPU (Central Processing Unit) Card (17601)

This card has two hexadecimal switches. The upper switch is used to determine which action to take upon power on. Only two settings are valid: F is the normal setting, which will cause the computer to start the Harry software (in Eproms on the Rom/Ram card); 0 causes the computer to the enter the basic machine monitor and is used only for fault detection (the other settings will cause it to attempt to load a program off a variety of disks, none of which is fitted to Harry).

Only a few settings of the lower switch are used: they control the action taken by Harry at startup. 0 and all unused settings perform the normal startup self tests, then wait until the disks have run uup before entering the main menu. The other settings are intended to assist in diagnosing errors in the I/O store. Because the menu is held in the I/O store, menu driven tests cannot be used for fault finding. These tests all go into a mode where the I/O store is continuously written until the per is pressed, when it immediately enters the main menu regardless of whether the disks have run up. The settings are:

0. Normal setting - wait for disks to run up (maximum 40 secs).
1. Write digital bars into I/O store until pen pressed
2. Write grey wedge into I/O store until pen pressed
3. Write video from coded input into I/O store until pen pressed
4. Write video from RGB input into I/O store until pen pressed

5-E. As 0

F. Do not use - monitor may interpret as hardware error.

This card also has two push buttons on the card edge, one red and one black. The black one is used only for diagnostic purposes. The red button is the master computer reset and can be used to restart the computer in the event of a total system lockup.

5.2 CIO (Computer Input Output) Card (17600)

This card has two hexadecimal rotary switches which are used by the software to control various options. The normal correct configuration for these switches is both set to 0 in NTSC, and lower to 8, upper to 0 in Pal. These switches are interpreted as an eight bit byte as follows:

Bit	Switch	Val	Meaning
7	Lower	8	Ntsc if clear, Pal if set. MUST be set to the correct value.
6	Lower	4	If set, disables auto restart after software crash - software diagnostics from terminal instead.
5	Lower	2	Not used
4	Lower	1	Development only - MUST be clear
3	Upper	8	Not used
2	Upper	4	Not used
1	Upper	2	Ignore (but report) drastic disk errors if set
0	Upper	1	When set, data display o/p "mimics" menu - used only with severe hardware errors

5.3 Other Cards.

There are numerous other switches on many cards in the system, used for trouble-shooting the hardware. The normal operational position for these switches is

ALL RED SWITCHES UP.

Rotary switches and switches of colours than red can be ignored because they do not function unless a controlling red switch is not up. THERE ARE TWO EXCEPTIONS TO THIS RULE:

1. On the RGB Output card (17723), SW5 should be set to the central position to select RGB output or down to select Y, R-Y, B-Y output.

2. On the same card, SW6 should be set down to enable the RGB output syncs.

5.4 The Disks

The four disks have a number of configuration switches behind a hinged front panel, which is secured with locking screws on the side. For a full description of the functions of this panel, see the Fujitsu Disk Manual. The panel MUST be set up as detailed below or disk data can be erased.

5.4.1 Spindle Remote/Local. -

This switch should be set to Local (down) to enable the disk to run up - remote rundown is not used.

5.4.2 Ch 4/Ch 5 - This should be set to Ch 5 (down) since Harry uses all five disk channels together.

5.4.3 Rotation Ext-A/Int/Ext-B - This should be set to Ext-A to allow Harry (controller A) to control the rotation synchronisation of the disks

5.4.4 Enable/Disable A And B - These switches should be set to Enable A (left switch up) to allow Harry to use the disks A port and to Disable B (right switch down) to disable the unused B port of the disks.

5.4.5 RLTM/ABSL - This switch should be set to the ABSL (down) position to allow absolute rather than relative track addressing.

5.4.6 MRTZ - This switch is spring loaded and should be left in its normal (down) position. It performs a Manual Return To Zero when operated.

5.4.7 Drive Address - This bank of four switches should be all be set to the off (down) position to configure ALL FOUR drives as drive zero.

5.4.8 Sector Count - These two banks of switches should be set to the following pattern, where 0=off (down) and 1=on (up): 01001001-0101010. This defines a sector length of 9386 bytes

5.4.9 Rotary Display Select Switches - This switch selects which data is displayed on the line of leds on the panel. It may be left in any position EXCEPT Diag (which puts the disk into internal diagnostic mode).

5.4.10 Numbered Switches And Execute Switches - These switches are used for fault finding on the disk, and are not normally used. For safety the numbered switches should all be left down (off) and the spring loaded Execute switch should not be touched except by qualified personnel.

6 EXTERNAL CONNECTIONS

This section lists those External connections which will normally be connected by Harrys users. It does not list the connectors which would not normally be used, or connections which are "internal" to Harry (such as the disk cables).

6.1 Video Connections

6.1.1 Video Inputs. - These are normal 75 ohm video BNC coaxial inputs. All inputs except the Vid Ref are terminated by Harry. Vid ref is looped through to the Vid Ref output. The inputs are:

1. Vid Ref: Video Reference signal. This signal MUST be clean and jitter free since it provides the master timing signal to Harry.

2. Vid: This is the standard NTSC/Pal coded input.

3. R, G, B, Sync: Thes four connectors form the component input. They are used in two modes: RGB mode when their functions are as labelled, and Component mode when the R, G, and B inputs take on the functions R-Y, Y, and B-Y respectively.

6.1.2 Video Outputs - These are normal 75 ohm video BNC coaxial outputs. The outputs are:

1. Vid Ref: This is the looped through output from the input Vid Ref.

2. Vid Main, Vid Aux: These are two identical NTSC/Pal coded outputs.

3. R, G, B, Sync: These four connectors form the component output. They are used in two modes: RGB mode when their functions are as labelled, and Component mode when the R, G, and B inputs take on the functions R-Y, Y, and B-Y respectively.

4. Data Display: This connector has an asyncronous monochrome video signal generated by the computer and not used in Software V1-04 except for Diagnostic purposes.

5. Test: This connector produces a video level signal derived from the exclusive-or gate on the upper Mux-Demux card (17717). The inputs to this gate gate are fed from two sockets (TP11 and TP12) on the card edge, to which test probes may be fitted. This facility allows comparison of signals between different satellites when an osciloscope is not available.

6.2 Timecode Input

This input is a conventional Longditudinal Time Code audio input. Assuming the Timecode/cue card (17724) is fitted, Harry can read both Longditudinal Time code (input via this socket) and Vertical Interval Time Code (on the Coded input). Since the timecode is used only for synchronising with other timecode oriented devices, Harry does not output timecode.

If both LTC and VITC are present, Harry will chose LTC in preference. To select VITC, remove the LTC from this input.

6.3 Remote

This 37 way D-type socket provides a number of input and output facilities, provided the Timecode/Cue card (17724) is fitted.

6.3.1 Output Cues. - Harry supplies 12 output cues (only four of which are driven by Software V1-01). These are in the form of a relay closure, the two ends of the relay being made available on the socket. The normal, inactive, state of these relays is open circuit; when active, the relay is closed, shorting the two ends together. A 5V supply (see below) available on this socket can be connected to one of the ends of the relay (with a suitable pulldown on the other) to convert the open/closed signal to a 0V/5V signal.

Harry also has an overtemperature alarm built in, which normally operates an internal audible warning if (for example in the event of a fan failure) Harry has an internal overheat. The alarm signal is made available on another relay.

The limitations on the relays used for these outputs are:

1. Max current 100mA
2. Max differential voltage 20V
3. Max appled voltage +/- 20V with respect to Remote plug 0V

6.3.2 Input Cues - Harry has four input cues, used to trigger Record and Play. These are triggered by pulling an input on the Remote socket to 0V to operate an internal relay. Harry can be operated with the cues being used in either polarity (active = true or active = false) - see description of Record Menu for explanation.

The limitations on the Input cues are:

1. Inactive state: open circuit or connected to >=2.4V with respect to Remote plug 0V.
2. Active state: connect to 0V
3. Allowed voltage range -0.2V to +5.5V.

6.3.3 +5V Supply - As explained above, there is a 5V supply to drive the output relays. This is current limited to a maximum output of 50ma. No other supply should be connected to these pins.

6.3.4 Pinout - The allocation of pins on the remote socket is as follows:

Output Cue 1	8,27
Output Cue 2	7,26
Output Cue 3	6,25
Output Cue 4	5,24
Output Cue 5	4,23
Output Cue 6	3,22
Output Cue 7	2,21
Output Cue 8	1,20
Output Cue 9	9,28
Output Cue 10	11,30
Output Cue 11	12,31
Output Cue 12	13,32
Overtemp Alarm	36,37
Input Cue 1	17
Input Cue 2	16
Input Cue 3	15
Input Cue 4	14

+5V (protected)	18,19
0V (Ground)	29,33,34,35
No Connection	10

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